



Pathological Internet use among adolescents: Comparing gamers and non-gamers

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ABSTRACT

“Internet gaming disorder” was recently included in Section 3 of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). Non-gaming Internet activities were not considered because of a lack of evidence. This study examined whether gamers differ from non-gamers with respect to their psychological well-being among students who show pathological Internet use (PIU). This cross-sectional study was conducted within the project “Working in Europe to Stop Truancy Among Youth (WE-STAY)”. A total of 8807 European representative students from randomly selected schools were included. The Young Diagnostic Questionnaire was applied to assess PIU, and students with this condition were divided into gamers (PIU-G) and non-gamers (PIU-NG). Overall, 3.62% and 3.11% of the students were classified as having PIU-G and PIU-NG, respectively. A multinomial logistic regression revealed that students with PIU-G and those with PIU-NG showed similarly increased risks for emotional symptoms, conduct disorder, hyperactivity/inattention, self-injurious behaviors, and suicidal ideation and behaviors. Students with PIU-G were more likely to be male and have a higher risk for peer problems than those with PIU-NG. Students with PIU-NG had a higher risk of depression than those with PIU-G. The significant psychological impairment of PIU-NG suggests that it should be considered in future diagnostic criteria.

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1. Introduction

Research has shown the potential harmful effects caused by pathological use of the Internet (Schimmenti et al., 2014a). In the past, different terms and concepts have been applied to pathological

Internet use (PIU). Many authors have investigated PIU in general (Durkee et al., 2012; Fu et al., 2010), which has also been referred to as “Internet addiction” (Young, 1998), “computer addiction” (Wieland, 2005), “compulsive Internet use” (Meerkerk et al., 2006) and “problematic Internet use” (Caplan, 2002). Some studies have even specially focused on Internet gaming (Ko et al., 2005). For this condition, terms such as “pathological video gaming” (King et al., 2013), “video game addiction” (Mößle and Rehbein, 2013), “problematic computer game use” (Festl et al., 2013) and “problematic online game use” (Kim and Kim, 2010) have been used. Though different terms and definitions have been used previously, the construct of PIU implies a pattern of uncontrolled Internet use resulting in clinical impairment or distress.

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In the Young Diagnostic Questionnaire (YDQ; Young, 1998), a widely used tool to investigate PIU (Bakken et al., 2009; Cao et al., 2007; Durkee et al., 2012), five out of eight criteria have to be met for a diagnosis of PIU. These criteria bear great similarity to the new DSM-5 criteria for “Internet gaming disorder” (see Table 1). This condition of increasing interest was recently included in Section 3 of the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5) released in May 2013 (APA 2013), thus calling for additional research (Petry et al., 2014). According to the American Psychiatric Association (APA), Internet gaming disorder is based on 9 criteria: preoccupation with Internet games, withdrawal symptoms, tolerance, loss of control, loss of interests in previous hobbies and entertainment, continued excessive use despite knowledge of psychosocial problems, dissimulation, dysfunctional affect regulation, hazard and loss. Five of these 9 criteria must be present over a 12-month period for diagnosis. The meetings regarding the next version of the International Classification of Diseases (ICD-11; which is expected to be published in 2015) have discussed whether a new section called “behavioral addictions” with the subtopic “computer and Internet addiction” should be included (Mann et al., 2013).

Furthermore, the condition of an Internet gaming disorder requires that the symptoms should lead to clinically significant impairments or distress. Both general PIU and Internet gaming are significantly associated with comorbid psychopathologies, risk-taking and self-harming behaviors, and an overall reduction in psychological well-being (Caplan, 2002; Gentile et al., 2011; Ha et al., 2007; Kaess et al., 2014; Ko et al., 2009; Lemmens et al., 2011; Van Rooij et al., 2011). Nevertheless, a lack of studies exists regarding a specific focus on non-gaming Internet activities or comparisons with gaming activities.

Currently, the new DSM-5 criteria for Internet gaming disorder refer exclusively to online (and offline) computer games. The debate is ongoing as to whether other forms of online activities have a similar addictive potential and might be associated with similar psychological impairments (Schimmenti et al., 2014a). The addictive potential of different Internet applications was recently assessed in a longitudinal study of 447 heavy Internet users (Meerkerk et al., 2006). Although the majority of time spent online included e-mailing, downloading, chatting and surfing, the authors found that gaming and searching for online sexual activities were the most important Internet applications associated with PIU. In contrast,

other studies suggest that applications involving social interactions may also abet the development of PIU (Caplan, 2002; van den Eijnden et al., 2008). Petry and O'Brien (2013) stated that additional research is needed to “identify the defining features of the condition” and to “determine prevalence rates in representative epidemiological samples in countries around the world”.

The aim of the study was to empirically contribute to the ongoing debate if non-gaming Internet activities should also be included in a future diagnostic category (e.g. in the ICD-11) as this has important implications for both prevention and therapy. Thus, the primary focus of the present study was to examine a representative sample of European adolescents to identify individuals with PIU who engage in online gaming (PIU-G) and those with PIU who engage in online activities other than gaming (PIU-NG). Furthermore, any differences with regard to their comorbid psychopathologies, engagement in self-harming behaviors and psychological well-being were also assessed.

2. Methods

2.1. Procedures and sample

The present study was conducted within the framework of the “Working in Europe to Stop Truancy Among Youth (WE-STAY)” project funded by the 7th Framework Program (FP7) of the European Union. Representative samples were recruited in accordance with previously established and validated procedures from the “Saving and Empowering Young Lives in Europe” (SEYLE) study (Carli et al., 2013; Wasserman et al., 2010). In each country, a list of all eligible schools within the study sites was generated according to specific inclusion and exclusion criteria. Finally, 132 randomly selected schools were recruited from the following European countries: Estonia, Germany, Italy, Romania and Spain. Sweden served as the coordination center, and experts from Columbia University, New York, United States provided methodological consultation. Ethical approval was obtained from the local ethics committees at each study site. After a complete description of the study was provided to participants and their parents, their written informed consent was obtained. All questionnaires were administered at the schools and in the official language of the respective country.

Table 1

Operationalization of the criteria for PIU assessed using the YDQ items and compared with the criteria for Internet gaming disorder in the DSM-5.

PIU (YDQ; (Young, 1998))	Internet gaming disorder (DSM-5)
Defined as: Time spent online for non-academic or non-job (i.e., recreational) purposes	Persistent and recurrent use of Internet games leading to clinically significant impairments or distress
Cut-off: ≥ 5	Note: Can involve non-Internet computerized games
Questions	Criteria
Do you feel preoccupied with the Internet (i.e., do you think about previous online activities or anticipate your next online session)?	Preoccupation with Internet games
Do you feel restless, moody, depressed or irritable when you attempt to cut down or stop Internet use?	Withdrawal symptoms when Internet gaming is taken away
Do you feel the need to use the Internet in increasing amounts of time to achieve satisfaction?	Tolerance: the need to spend increasing amounts of time engaged in Internet games
Have you repeatedly made unsuccessful efforts to control, cut back or stop Internet use?	Unsuccessful attempts to control participation in Internet games
Do you stay online longer than you originally intended?	Loss of interest in previous hobbies and entertainment as a result of (and with the exception of) Internet games.
Have you jeopardized or risked the loss of significant relationships, jobs, or educational opportunities because of the Internet?	Continued excessive use of Internet games despite knowledge of psychosocial problems
Have you lied to your family members, therapist or others to conceal the extent of your involvement with the Internet?	Has jeopardized or lost a significant relationships, jobs, or educational/career opportunities because of participation in Internet games
Do you use the Internet as a way of escaping from problems or relieving dysphonic moods (e.g., feelings of helplessness, guilt, anxiety or depression)?	Has deceived family members, therapists, or others regarding amount of Internet gaming
	Use of Internet games to escape or relieve a negative mood

The study sample was composed of 9758 students (55.1% female/44.9% male; mean age = 15.0 years, *S.D.* = 1.3 years) who completed the questionnaire; 951 students were excluded because of missing data concerning gender, PIU, or psychosocial variables. Ultimately, 8807 students were included in the present analyses. The distribution with regard to the different countries was as follows: 1558 of the students came from Estonia, 2564 from Germany, 2117 from Italy, 1237 from Romania and 1331 from Spain.

2.2. Psychological measures

PIU was assessed using the Young Diagnostic Questionnaire (YDQ) (Young, 1998). The YDQ has been widely used to investigate PIU (Bakken et al., 2009; Cao et al., 2007; Durkee et al., 2012). The diagnosis of PIU is based on a pattern of Internet use resulting in clinical impairment or distress. Eight criteria are retrospectively evaluated in the YDQ over the last year using “yes” or “no” questions, with a total score ranging from 0 to 8. These criteria bear great similarity to the criteria mentioned in the DSM-5 for Internet gaming disorders (see Table 1), including both conditions’ having to meet five criteria for a diagnosis of PIU. In the present study, all students were screened with the YDQ for PIU as a first step. Students fulfilling five or more criteria in the YDQ were classified as having PIU. Students who fulfilled four or less criteria in the YDQ were classified as non-PIU.

Furthermore, the frequency of Internet application use (e.g., for gaming, chatting, surfing, and school work) was assessed on a 4-point Likert scale (“never”, “occasionally”, “frequently” or “always”). Only Internet applications used frequently or always were considered in the statistical analysis. Gaming was defined as playing single or multi-user online games. Chatting included writing or reading e-mails, visiting chat rooms and using social networks. Surfing included reading the news, downloading music or videos, watching videos and using other services. In a second step, all students with PIU were divided into those who frequently engaged in gaming activities (PIU-G) and those frequently engaged in Internet applications other than gaming (PIU-NG).

The Beck Depression Inventory II (BDI-II) (Beck et al., 1996) was used to assess depressive symptoms. The BDI-II contains 21 questions with possible scores ranging from 0 to 3. Conduct disorder was assessed using the DISC Predictive Scales for conduct disorder (DPS-CD) (Lucas et al., 2001), a diagnosis-specific self-report inventory. The total score ranges from 0 to 8 and corresponds to the number of positive answers provided. The Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997) was administered to assess various emotional and behavioral problems. The present study used the sub-scales emotional symptoms, hyperactivity/inattention, and peer problems. Each sub-scale contained 5 items, and the scores ranged from 0 to 10.

The World Health Organization (WHO)-Five Well-being Index (WHO-5) was used to measure dimensions of general psychological well-being (Primack, 2003). The raw score ranges from 0 to 25, where 0 represents the worst possible quality of life and 25 represents the best possible quality of life. For statistical analysis, the WHO-5 raw score was converted into a percentage (0–100%).

Suicidal behavior over the last year was assessed using the Paykel Suicide Scale (PSS) (Paykel et al., 1974), which includes all stages of suicidal tendency. Suicidal behavior was identified when any suicidal thoughts, suicide plans or suicide attempts were reported. A modified version (Brunner et al., 2014) of the Deliberate Self-Harm Inventory (DSHI) (Gratz, 2001) was used to distinguish between different forms of self-injurious behavior (e.g., cutting, burning, scratching, wound manipulation, and head banging). Self-injurious behavior was assessed when students reported any engagement in these acts over the last year.

2.3. Statistical analyses

Descriptive analyses were used to determine the rates of normal Internet use, PIU-G and PIU-NG by gender and country, respectively. Means and standard deviations (SDs) were calculated for the dimensional variables (BDI-II, DPS-CD, SDQ, and WHO-5). The results are presented as boxplots. For all dimensional variables analysis of variance (ANOVA) was calculated, followed by pairwise Group comparisons with Tukey’s HSD adjustment for multiple testing. The frequencies of the categorical variables (suicidal and self-injurious behaviors) were described for the three Internet user groups. For each categorical variable, comparisons between the Internet groups were calculated with logistic regressions followed by pairwise group comparisons with Sidak’s correction for multiple testing. Following this univariate approach, a multinomial regression analysis was calculated using groups of internet use (normal, PIU-G, and PIU-NG) as dependent variables; gender, BDI-II, DPS-CD, SDQ-sub-scales, WHO-5, PSS and DSHI were used as explanatory variables. Missing values among the explanatory variables were replaced with multiple imputed values using multivariate imputation based on the chained equations algorithm to prevent estimation bias due to participant exclusion. The regression was then calculated for each of the 20 imputed datasets, and the results were combined. The continuous explanatory variables were standardized to ease the coefficient interpretation. The regression coefficients are presented in their exponential form as relative risk ratios, with respect to normal Internet use as base category. All statistical analyses were performed with Stata 13. A significance level of $p = 0.05$ was chosen.

3. Results

Of the 8807 students included in the analysis, 4889 (55.5%) were female, and 3918 (44.5%) were male. The mean sample age was 15.0 years (*S.D.* = 1.3 years). A total of 8214 (93.3%) students reported normal Internet use, whereas 319 (3.6%) and 274 (3.1%) students met the criteria for PIU-G and PIU-NG, respectively. Although the adolescents classified as PIU-G were primarily male (27.0% female; 73.0% male), those categorized as PIU-NG were predominately female (78.8% female; 21.2% male). The association between Internet use and gender was significant ($\chi^2[2] = 166.0, p < 0.001$).

Within the PIU-G group, 100% of the adolescents used the Internet for gaming; 97.5% used the Internet for chatting; 97.8% used the Internet for other Internet applications; and 45.9% used the Internet for schoolwork. Within the PIU-NG group, 0% reported engaging in gaming; instead, 95.6% used the Internet for chatting; 96.4% used the Internet for other Internet applications; and 47.8% used the Internet for schoolwork. Among students who showed normal Internet use, 35.3% used the Internet for gaming; 92.9% used it for chatting; 92.5% used it for other Internet applications; and 55.4% used it for schoolwork.

The distributions of the dimensional scores (i.e., those regarding depression, conduct disorder, emotional symptoms, hyperactivity/inattention, peer problems, and well-being) for the three Internet user groups are shown in Fig. 1. The frequencies of suicidal and self-injurious behaviors for the three Internet groups are presented in Fig. 2. Table 2 presents detailed information on these variables for each group including the respective group differences. Pairwise group comparison of the different Internet use groups revealed significant differences between the normal Internet use group and PIU-G for BDI-II, DPS-CD, SDQ emotional symptoms, SDQ hyperactivity, SDQ peer problems, PSS and DSHI. Likewise, significant differences were found between the normal Internet use group and PIU-NG regarding all psychological variables (BDI-II, DPS-CD, SDQ emotional symptoms, SDQ hyperactivity, SDQ peer problems,

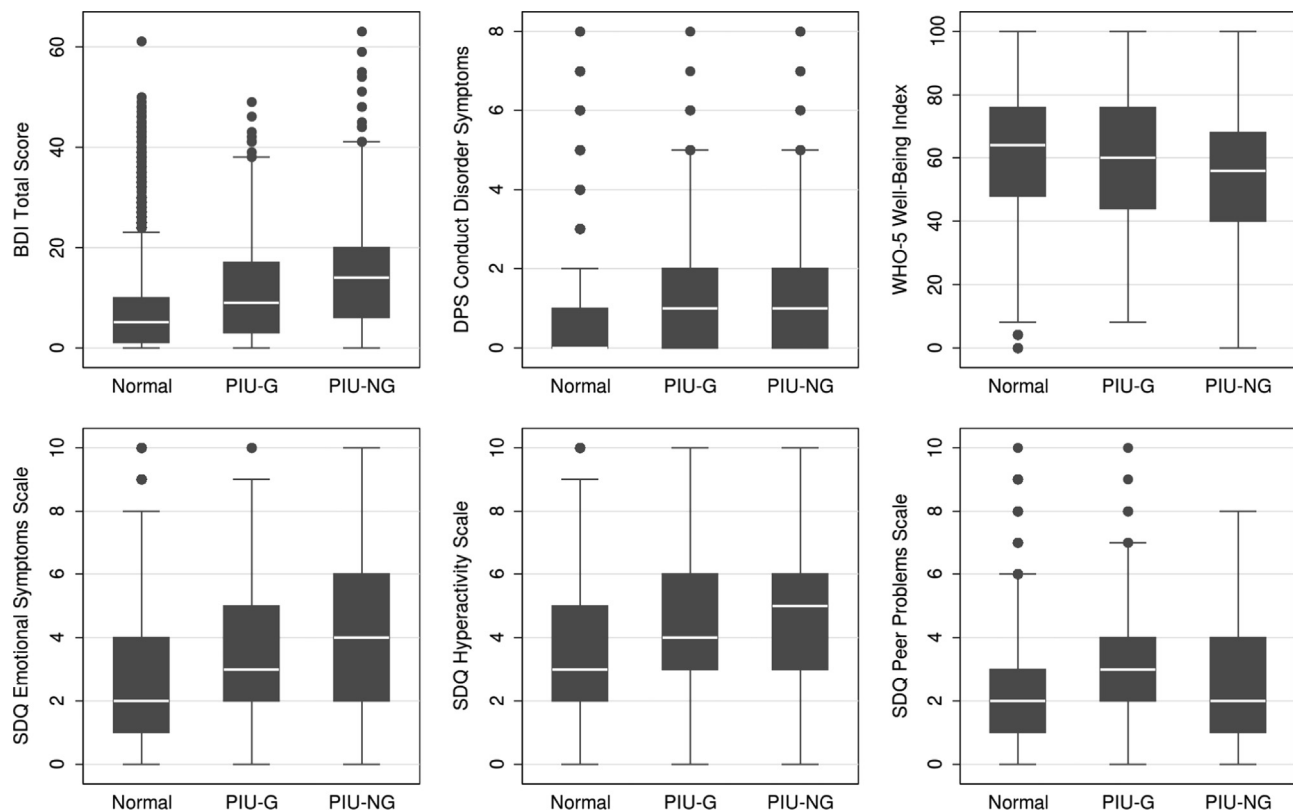


Fig. 1. The distribution of abnormal psychology dimensional scores (i.e., depression, conduct disorder, reduced well-being, emotional symptoms, hyperactivity, and peer problems) for the 3 Internet groups (normal Internet use, PIU-NG, and PIU-G). The boxplots show medians, first quartiles, third quartiles and outliers.

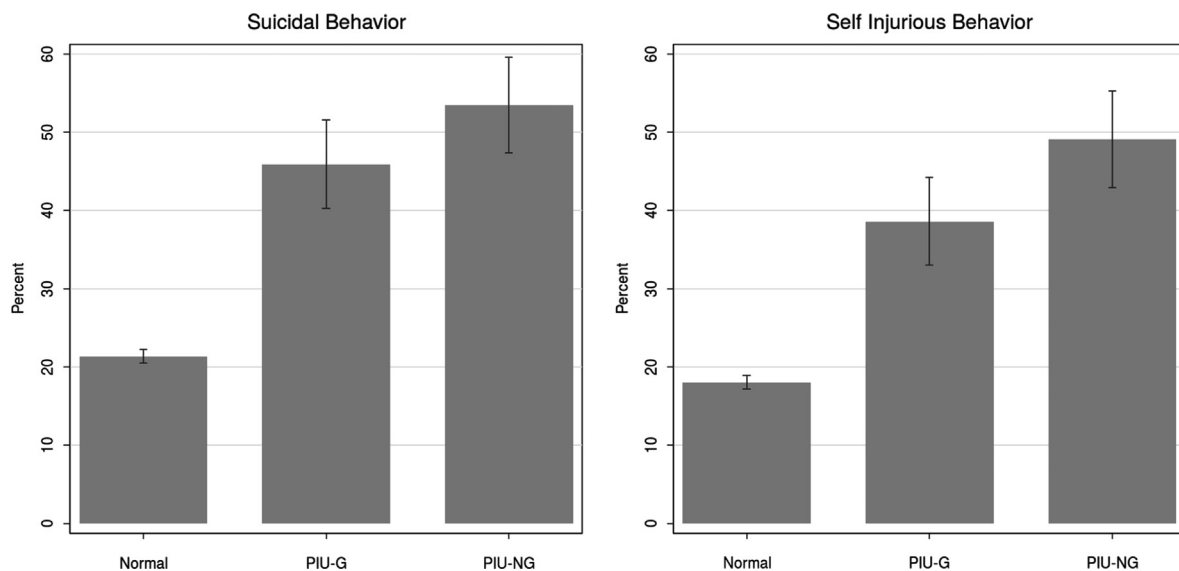


Fig. 2. The percentages (%) and their 95% confidence intervals of suicidal and self-injurious behaviors within the 3 Internet groups (normal Internet use, PIU-NG, and PIU-G).

WHO-5, PSS and DSHI) In the univariate approach comparison between the groups of PIU-G and PIU-NG indicated significant differences with respect to self-injurious behavior ($p=0.033$), depression ($p<0.001$), emotional symptoms ($p<0.001$), well-being ($p<0.001$) and peer problems ($p=0.028$).

The results of multinomial logistic regression showed that depression, conduct disorder, hyperactivity/inattention, and suicidal and self-injurious behaviors were all associated with increased risks for both PIU-G and PIU-NG in relation to the group of normal Internet users (see Table 3). Males with reduced well-being, emotional symptoms and peer problems were more likely to be

classified as PIU-G. The regression model explained 14.4% of the information of the PIU categorization (Pseudo R^2).

Post hoc comparisons of the relative risk ratios (RRR) confirmed some significant differences between adolescents with PIU-G and those with PIU-NG with regards to gender (males: PIU-G > PIU-NG, $p<0.001$), depression (PIU-NG > PIU-G, $p=0.021$) and peer problems according to SDQ (PIU-G > PIU-NG, $p=0.002$). No significant differences were found between PIU-G and PIU-NG with regard to all other variables (emotional symptoms, conduct disorder, hyperactivity, well-being, suicidal and self-injurious behaviors).

Table 2

Means and standard deviations (S.D.) of the dimensional variables, frequencies (*n*) and percentages (%) of the categorical variables for the three Internet user groups, and effect sizes between groups (Cohen's *d* for continuous variables and odds ratios for categorical variables).

	Normal		PIU-G		PIU-NG		PIU-G vs. normal	PIU-NG vs. normal	PIU-NG vs. PIU-G
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Cohen's <i>d</i>	Cohen's <i>d</i>	Cohen's <i>d</i>
Depression (BDI total score)	6.90	7.37	11.27	9.96	16.25	10.95	0.58***	1.24***	0.48***
Conduct disorder (DPS)	0.63	1.06	1.40	1.60	1.32	1.37	0.71***	0.64***	–0.06
Emotional symptoms (SDQ)	2.70	2.14	3.43	2.41	4.36	2.38	0.34***	0.77***	0.39***
Hyperactivity (SDQ)	3.48	2.10	4.58	2.00	4.95	2.00	0.53***	0.70***	0.18
Peer problems (SDQ)	1.97	1.60	2.88	1.85	2.54	1.75	0.56***	0.35***	–0.19*
Well-being (WHO-5)	61.22	18.67	59.22	19.05	50.68	20.11	–0.11	–0.56***	–0.44***
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	OR	OR	OR
Suicidal behaviors (PSS)	1748	21.36	144	45.86	146	53.48	3.12***	4.23***	1.36
Self-injurious behaviors (DSHI)	1450	18.05	119	38.51	131	49.06	2.84***	4.37***	1.54*

* $p < 0.05$

*** $p < 0.001$

Table 3

Multinomial logistic regression of gender, well-being, psychopathology, and self-harming behaviors among adolescents with PIU-G and those with PIU-NG.

Psychosocial variables	PIU-G			PIU-NG		
	RRR	95% CIs	<i>p</i>	RRR	95% CIs	<i>p</i>
Male	4.30	3.24–5.71	< 0.001	0.45	0.32–0.62	< 0.001
Depression ^a (BDI-II)	1.25	1.10–1.43	0.001	1.54	1.35–1.75	< 0.001
Conduct disorder ^a (DPS)	1.24	1.14–1.36	< 0.001	1.30	1.18–1.45	< 0.001
Emotional symptoms ^a (SDQ)	1.20	1.04–1.38	0.014	1.04	0.89–1.21	0.637
Hyperactivity ^a (SDQ)	1.28	1.13–1.45	< 0.001	1.35	1.20–1.54	< 0.001
Peer problems ^a (SDQ)	1.27	1.14–1.42	< 0.001	0.99	0.88–1.13	0.937
Well-being ^a (WHO-5)	1.25	1.09–1.42	0.001	1.04	0.90–1.20	0.587
Suicidal behaviors (PSS)	1.82	1.37–2.42	< 0.001	1.36	1.01–1.84	0.045
Self-injurious behaviors (DSHI)	1.56	1.19–2.04	0.001	1.82	1.37–2.42	< 0.001

The regression coefficients are presented in their exponential form as relative risk ratios, with normal Internet use as base category. RRR: relative risk ratio; CIs: confidence intervals; PIU-G: pathological Internet use-gaming; PIU-NG: pathological Internet use-non-gaming.

^a Standardized scores

4. Discussion

This study investigated whether students with PIU-G and PIU-NG have an elevated risk for psychopathology in comparison to normal Internet users. However, the main scope of the study was to address the impact of non-gaming Internet activities among students with PIU, which (until now) has been scarcely investigated. Within the PIU group, adolescents with PIU-G were categorized separately from those with PIU-NG. Furthermore, these students were assessed with regard to their psychopathologies, self-harming behaviors and psychological well-being. In summary, students with PIU-G and those with PIU-NG showed elevated levels of psychopathology and more self-harming behaviors compared with normal Internet users. However, the differences between students classified as PIU-G and those categorized as PIU-NG were marginal.

PIU was assessed using the YDQ, which was developed in line with the DSM-IV definition of pathological gaming (Young, 1998); in fact, the YDQ shows strong similarities to the criteria of Internet gaming disorder in the DSM-5 (see Table 1). However, whereas the DSM-5 only refers to online gaming, the concept of PIU as measured by the YDQ includes other Internet applications (e.g., social Internet use or sexually oriented websites). Therefore, the frequency of Internet application use was assessed in combination with the YDQ, which enabled us to categorize students with PIU based on their gaming/non-gaming online activities.

The reported prevalence of Internet gaming disorders ranges between 0.2% (Festl et al., 2013) and 46% (Wan and Chiou, 2006). The prevalence of PIU shows a similar range, from 0.3%

(Aboujaoude et al., 2006) to 26.7% (Yu and Shek, 2013). These wide ranges are probably due to differences among the countries, concepts, definitions and study samples used. The rates in the present study (3.62% for PIU-G and 3.11% for PIU-NG) match those of other methodologically sound studies. Rates from 3% to 8.5% for online game addiction (Gentile et al., 2011; Van Rooij et al., 2011) and from 4% to 4.4% for PIU (Durkee et al., 2012; Rumpf et al., 2014) have been reported among adolescents in Europe. Our rates also suggest that PIU-G and PIU-NG are equally distributed among students who have PIU; furthermore, a large proportion of students with PIU might go undiagnosed using a classification system that refers exclusively to gaming.

The male gender was a strong and significant risk factor for PIU-G (RRR=4.3) but protective for PIU-NG (RRR=0.45). These results are in line with those previously obtained by other authors who clearly separated PIU-G from PIU-NG (Möslle and Rehbein, 2013). The present study clearly showed a significant increased risk for depression, conduct disorder, hyperactivity/inattention, suicidal and self-injurious behaviors for both PIU-groups in relation to the group of normal Internet users.

Thus far, most research has either investigated PIU in general or specifically online gaming in comparison to normal Internet use. Investigations of PIU have revealed associations with experience of childhood abuse and insecure attachment (Schimmenti et al., 2014b), depression (Ha et al., 2007; Yen et al., 2008), attention-deficit/hyperactivity disorder (Ko et al., 2009), emotional problems (Bakken et al., 2009), deliberate self-harming and suicidal behaviors (Kaess et al., 2014) and problems with peer relationships (Durkee et al., 2012). The results concerning the relationship between PIU

and well-being have been inconsistent (Caplan, 2002). Previous studies have examined the social and psychological benefits of Internet applications (Guan and Subrahmanyam, 2009); less research, however, has been performed on pathological Internet gaming. The studies conducted thus far on Internet gaming have similarly highlighted the associations between PIU and lower well-being (Festl et al., 2013; Lemmens et al., 2011), emotional problems (Gentile et al., 2011), attention-deficit/hyperactivity disorder (Gentile, 2009), depression (Van Rooij et al., 2011) and suicidal ideation (Wenzel et al., 2009). Based on previous data, it is possible that most of the psychological burden associated with addictive Internet behaviors are caused by Internet gaming. However, our data clearly indicate that PIU can occur without engagement in online gaming activities, and these behaviors might have similar negative mental health consequences.

To our knowledge, this study is the first to directly compare PIU-G and PIU-NG using the same assessment methodology in a large, multi-site European sample. Our results showed that both PIU-G and PIU-NG are associated with significant and elevated risks for psychopathologies and self-harming behaviors when compared to normal Internet users. The findings are critical for both prevention and treatment. As PIU-NG is associated with a significant increased risk for impairment and abnormal psychology (in comparison to adolescents without PIU), personalized interventions should be developed and offered. However, if Internet gaming disorder eventually becomes an official diagnosis, based on these findings 3.1% of European adolescents who suffer from PIU-NG would not be eligible for appropriate mental health consultation or therapy. The current DSM-5 criteria will likely narrow research activities to focus on online gaming only. In addition, additional reasons might exist as to why PIU-NG should be considered in future diagnostic criteria. For example, overlap exists between general PIU and pathological gaming with many contemporary Internet games based on the concept that social interactions are necessary to solve problems. Last but not least, our study showed that individuals with PIU-G also used other Internet applications to a large extent. In sum, the differences among online activities might share a variety of addictive characteristics that could be hard to distinguish because engagement in diverse online activities is likely the norm among adolescents. In fact, these findings should encourage questioning the recent decision of the APA to include only Internet gaming within the new diagnostic concept regarding the pathological and addictive developments of Internet behaviors (APA 2013) and might provide support for the broader inclusion of different online activities within the concept of “computer and Internet addiction” in the upcoming ICD-11.

Regarding the groups of PIU-G and PIU-NG, some differences were found: the students in the PIU-NG group were predominantly female and had higher amounts of depression. Because girls are more likely to be depressed, the possibility of a gender effect exists. However, gender was included in the multinomial logistic regression so any potential “gender effect” was already controlled. Individuals with PIU-NG might use the Internet as a way to self-medicate; thus, conscientious people who seek social contact and receive support in times of social withdrawal might not have a reduction in well-being.

Students in the PIU-G group were predominantly male and showed more peer problems. On the one hand, excessive gaming might lead to difficulties in engaging with people in real life and the deprivation of face-to-face contacts. On the other hand, excessive gamers might feel less competent in social relationships, and their virtual lives might offer the chance to commit themselves to relationships within the confident interspace needed to present their ideal selves. Students with PIU might prefer to hide behind avatars. Apart from this possibility, gaming might be a way to escape the complex nature of the conflicts of every-day life and achieve rewards more easily. These considerations are strengthened by a

recently published cluster analysis differentiating the heterogeneity of psychological motives behind problematic online gaming and calling for the development of personalized psychotherapeutic interventions (Billieux et al., 2015).

Because of the cross-sectional nature of the present study and some of the inconsistent results among the few longitudinal studies available, future prospective research is needed to determine directional and causal relationships among PIU (gaming and non-gaming), comorbid psychopathologies, self-harm and well-being.

4.1. Study strengths and weaknesses

The present study was conducted using a large representative sample of adolescents across different European countries. However, the study design was cross-sectional, and the information was based on self-report questionnaires rather than structured clinical interviews. Although the YDQ has sometimes been criticized in the past, the comparison between the YDQ and the DSM-5 criteria for Internet gaming disorder shows a large similarity with regard to both the criteria and the cut-off. As previous research has already highlighted that sub-threshold problematic Internet use not only has the same risk factors as PIU but also is associated with significant psychopathology (Durkee et al., 2012; Kaess et al., 2014), the present study did not further differentiate an at-risk Internet use group. In contrast, the group of normal Internet users includes the group of problematic or at-risk Internet users. However, even though the sub-threshold group is included in the non-PIU group, our results highlight significantly elevated relative risk ratios for most psychopathologies, which underline the strong effects. To further differentiate the pathological non-gaming Internet activities would have been very interesting. As this comparison is beyond the scope of our paper, future research should address this important topic. To our knowledge, our study is the first to compare groups of adolescents with PIU-G or PIU-NG; therefore, it adds to the current knowledge and offers a valuable contribution to the problem of defining the features of this condition (Petry and O'Brien, 2013).

4.2. Conclusion

Internet gaming disorder was included in Section 3 of the DSM-5 for the first time. Although other Internet applications are not currently mentioned in the DSM-5 (Petry and O'Brien, 2013), some authors have suggested that they have addictive potential as well (Caplan, 2002; Meerkert et al., 2006; van den Eijnden et al., 2008). The present study clearly demonstrated that adolescents with PIU-G and those with PIU-NG are generally similar with regard to their related psychopathologies and self-harming behaviors. Thus, our data add to the body of evidence showing that PIU-NG should be considered in the future diagnostic criteria for Internet-related addictive behaviors.

Contributors

DW was the project leader and coordinator of the WE-STAY project. VC, CWH, CW, and MS were members of the executive committee. MS, AA, JB, RB, DC and DW were site leaders of the study and supervised the design and implementation at the respective study sites. GF, RB, MS and PV were involved in the data collection for the study. ES and MK made a significant contribution to the analysis and interpretation of data. PP participated in the design of the study and performed the statistical analysis. ES drafted the manuscript. MK supervised the data analysis and writing of the manuscript including critical revision

of the manuscript. PP revised the article critically. All authors reviewed the manuscript for intellectual content. All authors read and approved the final version of the manuscript.

Conflict of interest

The authors declare that they have no conflict of interest.

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